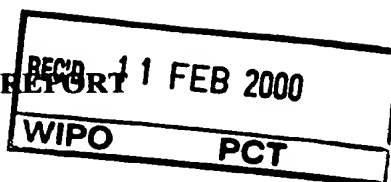


## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference Case 645 PCT	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE98/02193	International filing date (day/month/year) 01.12.1998	Priority date (day/month/year) 03.12.1997
International Patent Classification (IPC) or national classification and IPC <sub>7</sub> H 04 L 27/26, H 04 L 7/08 // H 04 J 3/12, H 04 L 5/06		
Applicant Telia AB (publ) et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.  
☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of \_\_\_\_\_ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  30.06.1999	Date of completion of this report  27.01.2000
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer  Jan Silfverling/CL Telephone No. 08-782 25 00

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE98/02193

## I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

- ☒ the international application as originally filed.
- ☐ the description, pages \_\_\_\_\_, as originally filed,  
 pages \_\_\_\_\_, filed with the demand,  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_.
- ☐ the claims, Nos. \_\_\_\_\_, as originally filed,  
 Nos. \_\_\_\_\_, as amended under Article 19,  
 Nos. \_\_\_\_\_, filed with the demand,  
 Nos. \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
 Nos. \_\_\_\_\_, filed with the letter of \_\_\_\_\_.
- ☐ the drawings, sheets/fig \_\_\_\_\_, as originally filed,  
 sheets/fig \_\_\_\_\_, filed with the demand  
 sheets/fig \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
 sheets/fig \_\_\_\_\_, filed with the letter of \_\_\_\_\_.

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/fig \_\_\_\_\_

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE98/02193

**V. Resoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	<u>1-23</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-23</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-23</u>	YES
	Claims		NO

**2. Citations and explanations**

The invention according to claims 1-23 relates to data scramblers and de-scramblers, for use in a multi-carrier transmission system.

The invention intends to simplify data scramblers by making use of synchronisation frames as a source of pseudo-random data, which can be combined with user data.

Synchronisation frame data is periodically transmitted to measure transmission channel characteristics and combiner means are provided to combine user data with frame synchronisation data.

Documents cited in the International Search Report:

D1: US 4387460, A  
D2: WO 9503656, A1  
D3: US 5148451, A  
D4: US 4646305, A  
D5: WO 9617455, A1

D1 discloses a digital data transmission system with supplementary information transmitting arrangement. The system comprises means for scrambling. (See col. 8, line 40 - col. 9, line 60.)

D2 discloses a method and an apparatus for synchronisation in transmission systems. Certain time slots have known synchronisation frames, containing tones or subcarriers, in the whole frequency spectrum with known phase selected in accordance with a pseudo random pattern. (See page 1, line 7 - line 15; page 4, line 25 - page 6, line 19.)

.../...

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE98/02193

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

D3 discloses a carrier regeneration device including a frame synchronising circuit. (See col. 4, line 57 - line 68)

D4 discloses a high-speed data modem using multilevel encoding. The incoming binary data stream is applied to a data scrambler and encoder. (Se col. 2, line 60 - line 68)

D5 discloses a method for synchronisation of transmitter and receiver at mobile radio systems.

The invention according to claims 1 - 23 differs from all documents stated above in the way of combining user data with frame synchronisation data.

In the light of the aforementioned:

-The invention claimed in claims 1 - 23 is novel (N), is considered to involve an inventive step (IS) and is considered to have industrial applicability (IA).

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE98/02193

## VI. Certain documents cited

## 1. Certain published documents (Rule 70.10)

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO9829978 A1	09.06.1998	23.12.1997	31.12.1996
WO9834368 A3	06.08.1998	30.01.1998	31.01.1997

## 2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)
--------------------------------	--	---

PCT

NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

PRAGSTEN, Rolf  
Telia Research AB  
Vitsandsgatan 9  
S-123 86 Farsta  
SUËDEInkom Kgp  
Telia Research AB

1999-06-18

Date of mailing (day/month/year) 10 June 1999 (10.06.99)		
Applicant's or agent's file reference Case 645 PCT		IMPORTANT NOTICE
International application No. PCT/SE98/02193	International filing date (day/month/year) 01 December 1998 (01.12.98)	
Priority date (day/month/year) 03 December 1997 (03.12.97)		
Applicant TELIA AB (publ) et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:

EP,JP,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

EE,LT,LV,NO

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 10 June 1999 (10.06.99) under No. WO 99/29078

**REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)**

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))**

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

## PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING  
SUBMISSION OR TRANSMITTAL  
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

PRAGSTEN, Rolf  
Telia Research AB  
Vitsandsgatan 9  
S-123 86 Farsta  
SUEDEInkom Kgp  
Telia Research AB

1999-02-12

Date of mailing (day/month/year) 04 February 1999 (04.02.99)	<b>IMPORTANT NOTIFICATION</b>
Applicant's or agent's file reference Case 645 PCT	
International application No. PCT/SE98/02193	
International publication date (day/month/year) Not yet published	
International filing date (day/month/year) 01 December 1998 (01.12.98)	Priority date (day/month/year) 03 December 1997 (03.12.97)
Applicant TELIA AB (publ) et al	

- The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
- An asterisk(\*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
- The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
03 Dec 1997 (03.12.97)	9704497-8	SE	27 Janu 1999 (27.01.99)

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. (41-22) 740.14.35	Authorized officer  Carlos Naranjo  Telephone No. (41-22) 338.83.38
--	---

## PCT

### NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

United States Patent and Trademark  
Office  
(Box PCT)  
Crystal Plaza 2  
Washington, DC 20231  
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year)

02 August 1999 (02.08.99)

International application No.

PCT/SE98/02193

Applicant's or agent's file reference

Case 645 PCT

International filing date (day/month/year)

01 December 1998 (01.12.98)

Priority date (day/month/year)

03 December 1997 (03.12.97)

Applicant

NORDSTRÖM, Tomas et al

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

30 June 1999 (30.06.99)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was



was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Jean-Marie McAdams

Telephone No.: (41-22) 338.83.38



## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>Case 645 PCT</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/SE 98/02193</b>	International filing Date ( <i>day/month/year</i> ) <b>1 December 1998</b>	(Earliest) Priority Date ( <i>day/month/year</i> ) <b>3 December 1997</b>
Applicant <b>Telia AB (publ) et al</b>		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).
2. ☐ Unity of invention is lacking (See Box II).
3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing
  - ☐ filed with the international application.
  - ☐ furnished by the applicant separately from the international application,
    - ☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
  - ☐ transcribed by this Authority.
4. With regard to the title, ☒ the text is approved as submitted by the applicant.  
☐ the text has been established by this Authority to read as follows:
5. With regard to the abstract,
  - ☒ the text is approved as submitted by the applicant.
  - ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:  
Figure No. 1 ☒ as suggested by the applicant. ☐ None of the figures.  
☐ because the applicant failed to suggest a figure.  
☐ because this figure better characterizes the invention.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/02193

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04L 27/26, H04L 7/08 // H04J 3/12, H04L 5/06  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04L, H04J, G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EDOC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4387460 A (PATRICK E. BOUTMY ET AL), 7 July 1983 (07.07.83), column 5, line 26 - column 9, line 60, figures 1-7, claims 1-10 --	1-23
A	WO 9503656 A1 (TELIA AB), 2 February 1995 (02.02.95), page 1, line 7 - line 15; page 4, line 25 - page 6, line 19, figures 1,2, claims 1-7 --	1-23
A	US 5148451 A (SUSUMU OTANI ET AL), 15 Sept 1992 (15.09.92), column 1, line 1 - column 4, line 68, figure 1, claims 1-6 --	1-23



Further documents are listed in the continuation of Box C.



See patent family annex.

\*

Special categories of cited documents:

"A"

document defining the general state of the art which is not considered to be of particular relevance

"E"

earlier document but published on or after the international filing date

"L"

document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O"

document referring to an oral disclosure, use, exhibition or other means

"P"

document published prior to the international filing date but later than the priority date claimed

"I"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;"

document member of the same patent family

Date of the actual completion of the international search

10 June 1999

Date of mailing of the international search report

14 -06- 1999

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Erik Johannesson/cs

Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/02193

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4646305 A (STEVEN A. TRETTER ET AL), 24 February 1987 (24.02.87), column 2, line 60 - column 3, line 10; column 5, line 64 - column 6, line 30, figure 1  --	1-23
A	WO 9617455 A1 (TELIA AB), 6 June 1996 (06.06.96), page 4, line 12 - page 6, line 20, claims 1-15  --	1-23
P,A	WO 9829978 A1 (ERICSSON INC.), 9 July 1998 (09.07.98), page 5, line 18 - page 7, line 15, claims 1-11  --	1-23
P,A	WO 9834368 A2 (TELEFONAKTIEBOLAGET LM ERICSSON), 6 August 1998 (06.08.98), claims 1-11  -- -----	1-23

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

03/05/99

International application No.

PCT/SE 98/02193

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	4387460	A	07/07/83	NONE	
WO	9503656	A1	02/02/95	EP 0712555 A SE 500986 C SE 9302453 A US 5652772 A	22/05/96 17/10/94 17/10/94 29/07/97
US	5148451	A	15/09/92	AU 627380 B AU 6655090 A CA 2029675 A,C DE 59009714 D,T EP 0427283 A,B JP 2513331 B JP 3153145 A	20/08/92 16/05/91 11/05/91 21/11/96 15/05/91 03/07/96 01/07/91
US	4646305	A	24/02/87	NONE	
WO	9617455	A1	06/06/96	EP 0795239 A SE 502656 C SE 9404121 A	17/09/97 04/12/95 04/12/95
WO	9829978	A1	09/07/98	AU 5623098 A US 5862160 A	31/07/98 19/01/99
WO	9834368	A2	06/08/98	AU 2239097 A AU 5889598 A EP 0883444 A SE 9700308 A	10/09/97 25/08/98 16/12/98 01/08/98



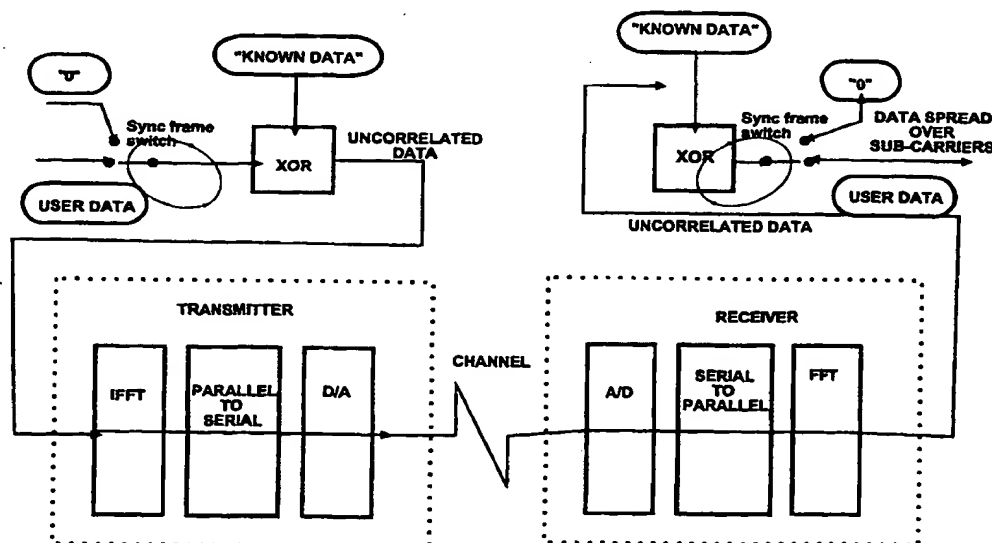
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>H04L 27/26</b>		<b>A2</b>	(11) International Publication Number: <b>WO 99/29078</b>
			(43) International Publication Date: 10 June 1999 (10.06.99)
(21) International Application Number: PCT/SE98/02193		STEFANSSON, Tomas [SE/SE]; Lulavan 773, S-961 93 Boden (SE). ÖHMAN, Hans [SE/SE]; Fältspatstigen 21, S-977 53 Luleå (SE). ÖKVIST, Göran [SE/SE]; Hagaplan 7, S-974 41 Luleå (SE).  (74) Agent: PRAGSTEN, Rolf; Telia Research AB, Vitsandsgatan 9, S-123 86 Farsta (SE).  (81) Designated States: EE, JP, LT, LV, NO, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) International Filing Date: 1 December 1998 (01.12.98)			
(30) Priority Data: 9704497-8 3 December 1997 (03.12.97) SE			
(71) Applicant (for all designated States except US): TELIA AB (publ) [SE/SE]; Mårbackagatan 11, S-123 86 Farsta (SE).			
(72) Inventors; and (75) Inventors/Applicants (for US only): NORDSTRÖM, Tomas [SE/SE]; Praktikantvägen 8, S-977 53 Luleå (SE). BAHLENBERG, Gunnar [SE/SE]; Blidvägen 234, S-976 32 Luleå (SE). BENGTSOON, Daniel [SE/SE]; Forskarvägen 36 A, S-977 53 Luleå (SE). HÅKANSSON, Siwert [SE/SE]; Aprilvägen 10, S-177 61 Järfälla (SE). ISAKSSON, Anders [SE/SE]; Elevvägen 1, S-977 25 Luleå (SE). ISAKSSON, Mikael [SE/SE]; Borgmästarevägen 7, S-973 42 Luleå (SE). JOHANSSON, Magnus [SE/SE]; Timmermansgatan 34, S-972 41 Luleå (SE). LJUNGGREN, Lis-Marie [SE/SE]; Praktikantvägen 31, S-977 53 Luleå (SE). LUNDBERG, Hans [SE/SE]; Västra Solgatan 8, S-972 53 Luleå (SE). OLOFSSON, Sven-Rune [SE/SE]; Malmuddsvägen 9, S-972 45 Luleå (SE). OLSSON, Lennart [SE/SE]; Majvägen 39, S-973 31 Luleå (SE).			

## Published

Without international search report and to be republished upon receipt of that report.

(54) Title: IMPROVEMENTS IN, OR RELATING TO, DATA SCRAMBLERS



## (57) Abstract

The present invention simplifies known data scramblers by making use of the synchronisation frames, normally used for measuring channel characteristics, as a source of pseudo-random data which can be combined with incoming user data. The present invention has particular application to multi-carrier transmission systems which employ DMT, or OFDM. Many of these transmission systems send known data, usually referred to as synchronisation frames, to measure channel characteristics such as signal to noise ratio. The known data contained in a synchronisation frame is selected to have a suitable statistical distribution, e.g. pseudo-random. In the data scrambler of the present invention, user data bits are combined with the known synchronisation frame data using an exclusive-OR function. This results in a statistically and computationally efficient scrambling of the user data.

**FOR THE PURPOSES OF INFORMATION ONLY**

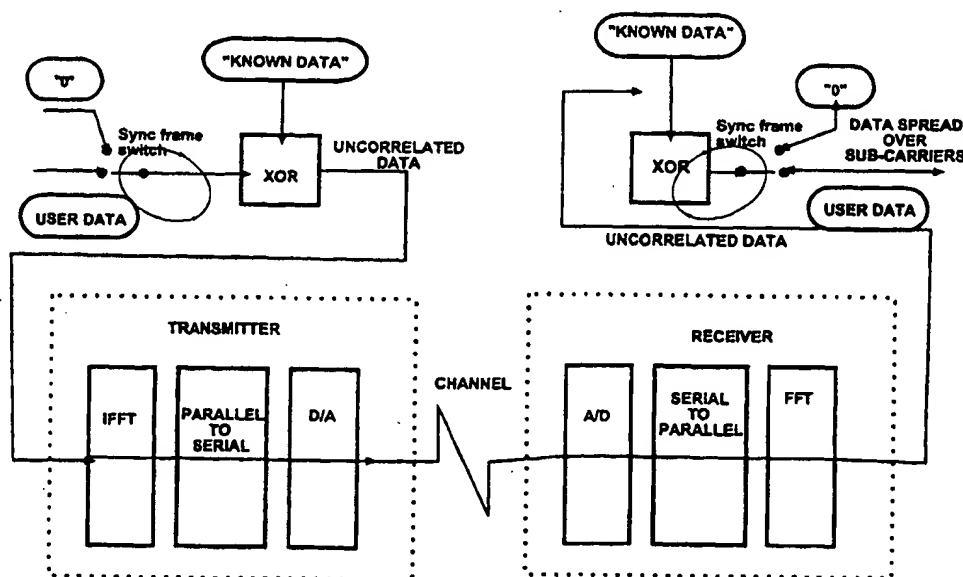
Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : H04L 27/26, 7/08 // H04J 3/12, H04L 5/06		A3	(11) International Publication Number: <b>WO 99/29078</b>
			(43) International Publication Date: 10 June 1999 (10.06.99)
(21) International Application Number: PCT/SE98/02193		STEFANSSON, Tomas [SE/SE]; Lulavan 773, S-961 93 Boden (SE); JOHMAN, Hans [SE/SE]; Fältspatstigen 21, S-977 53 Luleå (SE); KVKIST, Göran [SE/SE]; Hagaplan 7, S-974 41 Luleå (SE).  (74) Agent: PRAGSTEN, Rolf; Telia Research AB, Vitsandsgatan 9, S-123 86 Farsta (SE).  (81) Designated States: EE, JP, LT, LV, NO, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.  (88) Date of publication of the international search report: 12 August 1999 (12.08.99)	
(22) International Filing Date: 1 December 1998 (01.12.98)			
(30) Priority Data: 9704497-8 3 December 1997 (03.12.97) SE			
(71) Applicant (for all designated States except US): TELIA AB (publ) [SE/SE]; Mårbackagatan 11, S-123 86 Farsta (SE).			
(72) Inventors; and (75) Inventors/Applicants (for US only): NORDSTRÖM, Tomas [SE/SE]; Praktikantvägen 8, S-977 53 Luleå (SE); BAHLENBERG, Gunnar [SE/SE]; Blidvägen 234, S-976 32 Luleå (SE); BENGTTSSON, Daniel [SE/SE]; Forskarvägen 36 A, S-977 53 Luleå (SE); HÅKANSSON, Siwert [SE/SE]; Aprilvägen 10, S-177 61 Järfälla (SE); ISAKSSON, Anders [SE/SE]; Elevvägen 1, S-977 25 Luleå (SE); ISAKSSON, Mikael [SE/SE]; Borgmästarevägen 7, S-973 42 Luleå (SE); JOHANSSON, Magnus [SE/SE]; Timmermansgatan 34, S-972 41 Luleå (SE); LJUNGGREN, Lis-Marie [SE/SE]; Praktikantvägen 31, S-977 53 Luleå (SE); LUNDBERG, Hans [SE/SE]; Västra Solgatan 8, S-972 53 Luleå (SE); OLOFSSON, Sven-Rune [SE/SE]; Malmuddsvägen 9, S-972 45 Luleå (SE); OLSSON, Lennart [SE/SE]; Majvägen 39, S-973 31 Luleå (SE).			

(54) Title: IMPROVEMENTS IN, OR RELATING TO, DATA SCRAMBLERS



## (57) Abstract

The present invention simplifies known data scramblers by making use of the synchronisation frames, normally used for measuring channel characteristics, as a source of pseudo-random data which can be combined with incoming user data. The present invention has particular application to multi-carrier transmission systems which employ DMT, or OFDM. Many of these transmission systems send known data, usually referred to as synchronisation frames, to measure channel characteristics such as signal to noise ratio. The known data contained in a synchronisation frame is selected to have a suitable statistical distribution, e.g. pseudo-random. In the data scrambler of the present invention, user data bits are combined with the known synchronisation frame data using an exclusive-OR function. This results in a statistically and computationally efficient scrambling of the user data.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						



## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04L 27/26, H04L 7/08 // H04J 3/12, H04L 5/06  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04L, H04J, G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EDOC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4387460 A (PATRICK E. BOUTMY ET AL), 7 July 1983 (07.07.83), column 5, line 26 - column 9, line 60, figures 1-7, claims 1-10 --	1-23
A	WO 9503656 A1 (TELIA AB), 2 February 1995 (02.02.95), page 1, line 7 - line 15; page 4, line 25 - page 6, line 19, figures 1,2, claims 1-7 --	1-23
A	US 5148451 A (SUSUMU OTANI ET AL), 15 Sept 1992 (15.09.92), column 1, line 1 - column 4, line 68, figure 1, claims 1-6 --	1-23



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

10 June 1999

Date of mailing of the international search report

14 -06- 1999

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Erik Johannesson/cs

Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/02193

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4646305 A (STEVEN A. TRETTER ET AL), 24 February 1987 (24.02.87), column 2, line 60 - column 3, line 10; column 5, line 64 - column 6, line 30, figure 1  --	1-23
A	WO 9617455 A1 (TELIA AB), 6 June 1996 (06.06.96), page 4, line 12 - page 6, line 20, claims 1-15  --	1-23
P,A	WO 9829978 A1 (ERICSSON INC.), 9 July 1998 (09.07.98), page 5, line 18 - page 7, line 15, claims 1-11  --	1-23
P,A	WO 9834368 A2 (TELEFONAKTIEBOLAGET LM ERICSSON), 6 August 1998 (06.08.98), claims 1-11  -- -----	1-23

## INTERNATIONAL SEARCH REPORT

Information on patent family members

03/05/99

International application No.

PCT/SE 98/02193

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	4387460	A	07/07/83	NONE		
WO	9503656	A1	02/02/95	EP	0712555 A	22/05/96
				SE	500986 C	17/10/94
				SE	9302453 A	17/10/94
				US	5652772 A	29/07/97
US	5148451	A	15/09/92	AU	627380 B	20/08/92
				AU	6655090 A	16/05/91
				CA	2029675 A,C	11/05/91
				DE	59009714 D,T	21/11/96
				EP	0427283 A,B	15/05/91
				JP	2513331 B	03/07/96
				JP	3153145 A	01/07/91
US	4646305	A	24/02/87	NONE		
WO	9617455	A1	06/06/96	EP	0795239 A	17/09/97
				SE	502656 C	04/12/95
				SE	9404121 A	04/12/95
WO	9829978	A1	09/07/98	AU	5623098 A	31/07/98
				US	5862160 A	19/01/99
WO	9834368	A2	06/08/98	AU	2239097 A	10/09/97
				AU	5889598 A	25/08/98
				EP	0883444 A	16/12/98
				SE	9700308 A	01/08/98